

### Claim Listing

Please enter the following claims, which replace all prior claims in this matter.

1. (Currently Amended) An apparatus for programmably generating an illumination pattern superimposed on ~~a substrate~~ an electrode, said ~~substrate~~ electrode displaying lowered impedance in regions on its surface where it is illuminated, said illumination pattern having a predetermined arrangement of light and dark zones, said apparatus comprising:

a first substantially planar electrode in substantially parallel arrangement with another substantially planar electrode, with said electrodes being separated by a gap, and the gap containing an electrolyte solution, which is in contact with said electrodes and which contains suspended colloidal particles;

an illumination source capable of selectively illuminating a surface of the substrate electrode, whereby upon application of an AC voltage to the substrate electrode, the electric field in the illuminated regions of the surface is greater than in the non-illuminated regions of the surface, and wherein the illumination pattern is projected onto said first electrode so as to control the assembly and lateral motion of said colloidal particles, said assembly and lateral motion being induced by the AC voltage applied between said electrodes;

a reconfigurable mask composed of an array of pixels, said pixels being actively controllable and directly addressable by a computer-controlled circuit and computer interface, said computer-controlled circuit providing temporal control of the intensity of illumination emanating from said pixels so as to form the illumination pattern;

a projection system suitable for imaging the reconfigurable mask onto the substrate electrode; and

an imaging and recording system capable of viewing and recording said substrate electrode with superimposed illumination pattern.

2. (Previously Presented) The apparatus of claim 1, further comprising an image analysis system permitting acquisition of digitized images of the illumination pattern, analysis of said digitized images so as to extract features of interest, and thereby to permit creation of

derivative patterns based on said features of interest.

3. (Previously Presented) The apparatus of claim 1, wherein said computer-controlled circuit and computer interface are capable of accepting input from a video display adapter.

4. (Previously Presented) The apparatus of claim 1, wherein said array of pixels is actively controlled so as to permit adjustment of variable and controllable levels of pixel transmissivity or reflectivity.

5. (Previously Presented) The apparatus of claim 4, wherein said array of pixels comprises a liquid crystal display or a digital micromirror device.

6. (Previously Presented) The apparatus of claim 1, wherein said software program provides a series of illumination patterns, said patterns being produced interactively in a graphical user interface software program or being replayed from a storage device containing previously produced patterns.

7. (canceled)

8. (canceled)

9. (canceled)

10. (canceled)

11. (canceled)

12. (canceled)

13. (canceled)

14. (canceled)

stop

15. (Newly Added) An apparatus for programmably reconfiguring an array of particles on a light-sensitive planar electrode by programmable adjustment of an illumination pattern projected onto the light-sensitive planar electrode comprising:  
an illumination source;

a reconfigurable mask composed of an array of pixels, said pixels being actively controllable and directly addressable by means of a computer-controlled circuit and computer interface, said computer-controlled circuit being operated using a software program providing temporal control of the intensity of illumination emanating from each pixel so as to form the illumination pattern comprising the predetermined arrangement of light and dark zones;

a projection system suitable for imaging the reconfigurable mask onto the light-sensitive planar electrode, wherein the light-sensitive planar electrode, upon illumination, displays lowered impedance in the illuminated regions, said light-sensitive planar electrode being aligned with another planar electrode in substantially parallel arrangement, with said electrodes being separated by a gap, and the gap containing an electrolyte solution which is in contact with said electrodes and which contains colloidal particles suspended in the electrolyte solution; and

an imaging system incorporating a camera capable of viewing said light-sensitive planar electrode.

16. (canceled)

17. (canceled)

18. (canceled)

19. (canceled)

20. (canceled)

21. (canceled)

22. (canceled)

23. (canceled)

24. (canceled)

25. (canceled)

26. (canceled)

27. (canceled)

28. (Currently amended) A programmable patterning device for generating a chemically patterned surface or surface coating of an electrode comprising:

an apparatus for programmably generating an illumination pattern having a predetermined arrangement of light and dark zones on said surface, the apparatus comprising:

an illumination source;

a reconfigurable mask composed of an array of pixels, said pixels being actively controllable and directly addressable by means of a computer-controlled circuit and computer interface, said computer-controlled circuit being operated using a software program providing temporal control of the intensity of illumination emanating from each pixel so as to form the illumination pattern comprising the predetermined arrangement of light and dark zones;

a projection system suitable for imaging the reconfigured mask onto the surface; and an imaging system incorporating a camera capable of viewing said substrate electrode with superimposed illumination pattern; and

upon illumination by light of pre-selected spectral composition of the light-sensitive electrode surface or surface coating, a physical or chemical property of the surface or surface coating is altered in accordance with the illumination pattern.

29. (Previously Presented) The device of claim 28, wherein the physical or chemical property is solubility in a pre-selected solvent, and whereby the chemically patterned surface or surface coating is generated following illumination and upon exposure of the surface to said solvent.

30. (Previously Presented) The device of claim 28, wherein the physical or chemical property is chemical reactivity and wherein there is subsequent functionalization, following illumination, of the surface by chemical reaction.

31. (Previously Presented) The device of claim 28, wherein the spectral composition contains the wavelength of the visible spectrum.